

Original Research Article

Electrocardiographic findings, USG neck and Echocardiography in hypothyroidism**Md Yousuf Khan¹, P. Musa Khan², J. Thirupathi Rao³, P. Sakuntala⁴**¹*Associate Professor of General Medicine: Government Medical College, Nizamabad, Telangana state, India.*²*Associate Professor of General Medicine: Government Medical College, Nizamabad, Telangana state, India.*³*Associate Professor of General Medicine: Government Medical College, Nizamabad, Telangana state, India.*⁴*Associate Professor of General Medicine: Government Medical College, Nizamabad, Telangana state, India.***Received: 06-05-2021 / Revised: 05-06-2021 / Accepted: 13-07-2021****Abstract**

Introduction: Hypothyroidism is caused by insufficient secretion of thyroid hormones by the thyroid gland or by the complete loss of its function. The share of hypothyroidism among other endocrine diseases is gradually increasing. **Aims :** To study electrocardiographic findings, USG neck and echocardiography in hypothyroidism. **Materials and Methods:** The present study was an observational study included 100 hypothyroid patient for 2 years between January 2019 to December 2020 conducted in the department of General Medicine, Government Medical College, Nizamabad, T.S. **Results:** Most of cases (58%) were in the age group of 31-40 years and 21-30 years. Mean age score was 35.78 years with standard deviation of 17.41 years. There was an overall female preponderance among all age groups. The female population constituted about 84% of the total with female: male ratio of 5.2:1. The BMI of the study population most commonly belong to overweight category (71%) followed by obese (20%) and normal (9%). Majority of the patient were moderately hypothyroid (51%), 30% were severely hypothyroid and 19% were mildly hypothyroid. Sinus bradycardia was seen in upto 32% of the patients which was the most common ECG finding, 20%. Patients had normal ECG. The most common USG neck finding in the study population was thyroiditis constitute 31% where as 27% had normal USG neck. Diastolic dysfunction (38%) was the most common 2D echo finding in the study population. **Conclusion:** This study suggests that it is very important to evaluate patients of primary hypothyroidism for cardiovascular changes so that prior interventions could be performed to improve the clinical outcomes.

Keywords: Hypothyroidism, USG neck, Echocardiography, Electrocardiography

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Introduction

Thyroid diseases presents with either excess hormonal activity, or with symptoms due to under production of the hormone or with a swelling due to a neoplastic process or due to the pressure effects. Hypothyroidism is caused by insufficient secretion of thyroid hormones by the thyroid gland or by the complete loss of its function. The share of hypothyroidism among other endocrine diseases is gradually increasing. It is encountered in females more than in males. The idiopathic form of hypothyroidism occurs mainly in females older than 40 years. Hypothyroidism is usually progressive and irreversible. Treatment, however, is nearly always completely successful and allows a patient to live a fully normal life. The magnitude of these cardiac related findings lead early observers to wrongly postulate that thyrotoxicosis was a disease originating within the heart. But today there is a clear evidence for direct effects of these thyroid hormones on the myocardium in addition to indirect effects. The earliest description of thyrotoxicosis included reference to the rapid and occasionally irregular heart rate, warm skin, bounding pulses and hyperdynamic precordium[1]. Hypothyroidism has equivalent but essentially opposite effects on the cardiovascular system. Hypothyroidism may be associated with bradycardia, low voltage complexes, ST-T wave changes, atrioventricular and intraventricular conduction disturbances.

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Extrasystoles and tachyarrhythmias of both atrial and ventricular origins have been described in hypothyroidism with the ventricular tachyarrhythmias associated with prolonged QT interval[2].

Ultrasonography (USG) is the single-most valuable imaging modality in the evaluation of the thyroid gland. Indications for thyroid USG include evaluation for a palpable thyroid nodule or suspected thyroid enlargement and workup of thyroid nodules discovered incidentally. In addition to nodule detection and characterization, USG provides optimal guidance for fine needle aspiration biopsy (FNAB), which, despite some limitations, remains the gold standard for the characterization of thyroid nodules.³ In the present study we have assessed the electrocardiographic, USG neck and echocardiography findings in thyroid disorders and its correlation.

Materials and Methods

This study was conducted from January 2019 to December 2020 as a cross sectional descriptive study in the Department of General Medicine in Government Medical College, Nizamabad, T.S. to evaluate the electrocardiographic findings, USG neck and echocardiography in hypothyroidism. All diagnosed cases of hypothyroidism admitted in wards & attending OPD at Government General Hospital, Government Medical College, Nizamabad were included in the study. For the present study the prevalence was used to calculate the sample size for the study. Total 100 patients were selected. Non-probability convenient sampling method was used to select patients and who met the designed set of criteria. Following formula was used to calculate sample size.

Sample size (n) = 4 x pq / e² (q = 1- p)**Inclusion criteria**

All patients of thyroid disorder who are hypothyroid

Exclusion criteria

Hemodynamically unstable patients; Patients with lung disease, such as chronic obstructive pulmonary disease, asthma, or pleural disease, known cardiovascular disease, Patient who had pacemakers, metallic intravascular devices, any malignant disease (Except thyroid malignancy) , pregnancy and known diabetics were excluded from the study. After taking informed written consent, institutional scientific and ethical committee clearance all included patients were subjected to detail clinical history, thorough clinical examination and blood investigation like blood group, complete blood count, renal function test, liver function test, thyroid function test and ECG , 2D echo and USG neck. Third generation TSH assay is the current requirement for modern standards of care. TSH testing was carried out with automated platforms using advanced forms of immunometric assay. Nonetheless, there is currently no international standard for measurement of thyroid-stimulating hormone[3]. By using multichannel ECG machine. ECG was printed using the machine at 10 mm callibration with 25mm /s speed. USG Neck scans were done using Siemens Acuson X 300, Siemens Acuson X 600, colour Doppler equipment with a linear array high frequency (3-12 MHz) transducer. Sonography characteristics features like thyromegaly, echogenicity , vascularity or any nodule in the thyroid gland were noted. If nodules were present then it was identified as single or multiple and the size of the nodule was measured. Nodules smaller than 5mm were not characterized. Nodules larger than 5mm were characterized based on the echogenicity, shape of the nodule, margins of the nodule, contents within the nodule, calcifications in the nodule and vascularity in the nodule. The patients who had lesions in thyroid were subjected to FNAC with informed written consent. Following parameters were taken into study for USG

evaluation of the patients Thyroiditis, Colloid goitre, Multinodular goitre, Carcinoma, Multinodular goitre with thyroiditis and Normal . By using 2DECHO each case was screened specially for systolic, diastolic dysfunction, pericardial effusion and interventricular thickness. Diastolic dysfunction was assessed by means of the Canadian consensus criteria. Patients were grouped under the 5 groups if at least 4 of the criteria have been met. Systolic dysfunction was evaluated using the systolic time intervals as in other studies. PEP or the pre-ejection period, which is the time between the R wave on ECG and the opening of the aortic valve. It is the time interval between the electrical and mechanical activation of the heart. PEP is <105msec in males and <110msec in females . A value >0.76 is taken as the diagnosis of systolic dysfunction. Patients were categorized into two groups, either with or without systolic dysfunction. Statistical data was analysed using SPSS Inc., (Statistical Program for Social Science Inc.,) Chicago, IL, USA, version 20. Qualitative variables were expressed as frequency and percentage. Chi-square test was used to compare qualitative variables. Multivariate analysis and logistic regression were used to correlate associate risk factors. Quantitative variables were presented in terms of mean \pm standard deviation. Level of significance "P" value was evaluated, where P value < 0.05 was considered statistically significant.

Results

Present study was undertaken to study electrocardiographic findings , USG neck and echocardiography in cases of hypothyroidism in 100 cases, over a period of 2 year at the Government Medical College /Government General Hospital Nizamabad,T.S

Table 1: Age wise distribution of study population

Age Group(in years)	Frequency(n)	Percentage(%)
< 20	08	8%
21-30	24	24%
31-40	34	34%
41-50	20	20%
>51	14	14%
Total	100	100
Male	16	16%
Female	84	84%
BMI		
18.5-24.9	9	9%
25-29.9	71	71%
>30	20	20%

Most of cases were in age group of 31-40 and 21-30 years which totally constitute 58 % followed by 41-50 years (20 %), 14% belongs to >51 years and 8% in < 20 years of age group. Mean age score was 35.78 years with a standard deviation of 17.41 years. The

female population constituted about 84% of the total with female : male ratio 5.2:1. BMI of the study population most commonly belong to overweight category (71%), followed by obese 20% and normal 9% only.

Table 2: Severity of hypothyroidism in study population

Severity of hypothyroidism	Frequency(n)	Percentage(%)
Mild	19	19
Moderate	30	30
Severe	51	51

51% patient were moderately hypothyroid ,30% were severe and 19% were mild hypothyroid.

Table 3: ECG of study population

ECG Findings	Frequency(n)	Percentage(%)
Normal	20	20%
Sinus bradycardia	32	32%
Low voltage	13	13%
Prolonged Qtc	2	2%
ST-T changes	20	20%
VPC'S	13	13%

The most common ECG abnormality was sinus bradycardia(32%) followed by ST-T changes (20%) where as 20% of the patient had normal ECG

Table 4: USG neck of study population

USG neck Findings	Frequency (n)	Percentage (%)
Normal	27	27%
Thyroiditis	31	31%
Colloid goitre	23	23%
Multinodular goitre	3	3%
Carcinoma	7	7%
Multinodular goitre with thyroiditis	9	9%

USG neck was normal in 27% patients. Among abnormal USG ,thyroiditis constitute 31% and was the most common usg neck finding in the study population.

Table 5: 2D echocardiography of study population

Findings	Frequency (n)	Percentage (%)
Normal	27	27%
Systolic dysfunction	11	11%
Pericardial effusion	19	19%
Diastolic dysfunction	38	38%
IVS thickness	5	5%

2D ECHO finding was normal in 27% patients. Among abnormal 2D echo reports, diastolic dysfunction constitute 38% of the study population and was the most common 2D echo finding in the study population

Discussion

This was a cross sectional descriptive study conducted in the department of General Medicine in Government Medical College/ Government General Hospital, Nizamabad,T.S,to evaluate electrocardiographic findings ,USG neck and echocardiography in hypothyroidism . The age range of the study population was between 15-65 years, the most of the cases were in age group of 31-40 years and 21-30 years which totally constitute 58 %,followed by 41-50 years (20 %), 14% belongs to >51 years and 8% in < 20 years of age group. Mean age score was 35.78 years and standard deviation was 17.41years. There was an overall female preponderance among all age groups. The female population constituted about 84% of the total with female : male ratio 5.2:1. Analysis of the age distribution of patients showed that most of the patients were in the 3rd and 4th decade. Male accounting for 16% while female were 84% . Age and sex preponderance analysis showed statistical significance in the current study. This was correlating with the study done by Sanjeet Bagcchi *et al*[4]showing that highest prevalence of hypothyroidism (13.1%) was noted in people aged 46–54 years, with people aged 18–35 years being less affected (7.5%). In study done by AG Unnikrishnan *et al*[5] showed prevalence of hypothyroidism in Indian population was 10.95%, with significantly higher proportion of female Vs male (15.86% vs 5.02%). Subclinical hypothyroidism (SCH) was observed in 8.02% of the population. In study done by Kumaravel Velayutham *et al*[6]The overall prevalence of elevated TSH was 11% out of which 9.7% had mild TSH elevation. A low TSH was seen in 1.3% of the study population and concluded that thyroid dysfunction was common in young women in south India. One out of every eight young women had thyroid dysfunction, and mild TSH elevation was the most common abnormality. In the study done by Shashikanth.M *et al*[7] out of 50 subjects most patients belonged to the age groups of 31-40, there was an overall female preponderance over all age groups. The female population constituted about 76% of the total with female : male ratio 3:1. Similar demographic profile was mentioned in most of medicine text books including Harrison text book of internal medicine 20th edition. Analysis of the BMI category of the study population shows that 71% population was overweight and 20% were obese. In the study Anastasios Milionis and Charalampos Milionis *et al*[8] comprising 736 euthyroid persons, 616 females and 118 males

showed that almost 7 out of 10 subjects (70.9%) were overweight or obese (BMI > 25), 4 out of 10 (39%) were obese (BMI > 30), while almost 2 out of 10 (17%) were morbidly obese (BMI > 35). In the study done by A Nyrnes, R Jorde *et al*⁹ which was performed in 6164 subjects (2813 males) who attended the fifth Tromsø study in 2001, and in 1867 subjects (873 males) that attended both the fourth Tromsø study in 1994/1995 as well as the fifth Tromsø study showed a positive and significant association between serum TSH within the normal range and BMI, both in a cross-sectional and a longitudinal study. In the study done by Nils Knudsen, Peter Laurberg *et al*[10] 4649 participants were investigated, and 4082 were eligible for these analyses after exclusion showed that there was an association between obesity (BMI > 30 kg/m²) and serum TSH levels. Analysis of the study sample showed that 51% patient were moderately hypothyroid ,30% were severe and 19% were mild . In the study done by Dr. Shashikanth.M *et al*[7]showed that out of 50 enrolled cases 25(50%) were moderately hypothyroid 20(40%) were mildly hypothyroid and 5(10%) were severely hypothyroid. Analysis of ECG of the study population showed that it was normal in 20 patients (20%). Among abnormal ECG which constitutes 80% of the patients, bradycardia was seen in upto 32% of the patients and ST-T changes contributes 20%. This was correlating with the study done by Dr.Shashikanth.M *et al*,showed that ECG was normal in 18 patients (35%). Among abnormal ECG which constituted 65% of the patients, low voltage complexes and bradycardia was seen in upto 30% of the patients. LBBB & RBBB was found in 4% & 14% respectively. In the study done by R.Verma *et al*[11] sinus bradycardia was the most common finding(30%). In the study done by Preshant Shrivastava , Anirudh Tiwari *et al*[12] Sinus bradycardia in ECG was found in 35.5%, Low voltage complexes in 16.6%, T Wave inversion in 7.8%, RBBB in 4.4%, and QTc prolongation was found in 2.2% cases. Analysis of the USG neck in the study population showed that it was normal in 27% patients. Among abnormal USG, thyroiditis constitute 31% and was the most common USG neck finding in the study population. This study was correlating with study done by Dr.Anupriya *et al*,[13]showed that ultrasound was an excellent modality for diagnosing benign conditions such as thyroiditis, multinodular goiter and malignant conditions. In the study done by Jan Kratky, Jan Jiskra and Eliska Potlukova *et al*,[15]showed that in a hypothyroid patient, the thyroid USG may lead to cost savings: if a typical autoimmune pattern is present on thyroid ultrasound, the measurement of antithyroid antibodies is not necessary for the diagnosis of Hashimoto's thyroiditis. In the study done by Hanushraj.R , Sudharsan. S *et al*[16] diffuse thyromegaly was the

common radiological finding in USG. Multinodular goiter was the second common findings. Features of malignancy were seen in 6.67% of cases. Analysis of the 2D ECHO finding in the study population showed that it was normal in 27% patients. Among abnormal 2D echo reports, diastolic dysfunction constitute 38% of the study population and was the most common 2D echo finding in the study population and was correlating to the study done by Dr. Shashikanth.M et al[7]. In the study done by Preshant Shrivastava , AnirudhTiwari et al[12] 35% of the study population had normal parameters of echocardiography. The commonest abnormal finding in the sample was "diastolic dysfunction" seen in 20%patients. Other findings were pericardial effusion seen in 16.7% cases, increased inter ventricular septum diastolic dimension in 16.7% cases and increased left ventricular posterior wall thickness in 11.1% cases. In the study done by Faiza A Qari et al[17] there was a clear association of hypothyroidism with echocardiographic abnormalities like cardiomyopathy and pericardial effusion. It was also conclude that patients suffering from severe hypothyroidism as well as cardiomyopathy had quite low levels of EF. The present study is also in agreement with the literature given in Williams text book of endocrinology.

Conclusion

Most of cases were in age group of 31-40 years and 21-30 years which totally constitute 58 %. Mean age score was 35.78 years with a standard deviation of 17.41 years. The female population constituted about 84% of the total with female : male ratio 5.2:1 BMI of the study population most commonly belong to overweight category (71%). 51% patient were moderately hypothyroid ,30% were severe and 19% were mild. The most common ECG abnormality noted was sinus bradycardia(32%). Among the abnormal USG neck, thyroiditis constitute 31% and was the most common USG neck finding in the study population. Among abnormal 2D echo , diastolic dysfunction constitute 38% of the study population and was the most common 2D echo finding in the study population .

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